

UPPER VISÉAN GONIATITES FROM THE MANIFOLD VALLEY, NORTH STAFFORDSHIRE

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ABSTRACT. *Goniatites warslowensis* sp. nov. and *Pronorites ludfordi* sp. nov. are described from the Bollandian (P_{1c} Zone) of North Staffordshire.

INTRODUCTION

A RICHLY fossiliferous limestone band has been found by Mr. A. Ludford and Dr. D. Parkinson in Warslow Brook in the Manifold valley. The fauna, which includes *Posidonia becheri* and brachiopods, is chiefly remarkable for the abundance of solid goniatites in a good state of preservation, and the finders have placed these in my hands for examination and description. The goniatites are here referred to a new species of *Goniatites* and one of *Pronorites*. The occurrence of several specimens of the latter genus is unusual. This new species of *Pronorites* has sutural characters intermediate between those of *P. cyclolobus* (Phillips) and *P. (Stenopronorites) uralensis* (Karpinsky).

The bed from which these specimens were collected occurs in the bank of Warslow Brook at the Warslow–Clayton footbridge. Although occasional goniatites have been previously collected from Warslow Brook by G. B. Alexander and by Hudson (1945, p. 322) the localities referred to in the last-mentioned paper appear to lie about 250 yards upstream from the footbridge, and at a lower horizon. This area is also included in the paper by Prentice on the Carboniferous Limestone of the Manifold valley (1951, p. 190).

It would appear from a comparison of the new species of *Goniatites* with specimens collected by Mr. E. W. J. Moore from Dinckley, Lancashire, and from Eire, that the horizon of this Warslow Brook fauna lies between those of *G. falcatus* and *G. elegans*. All the specimens described have been presented to the Geological Survey Museum, London, and all registration numbers quoted are those of specimens in that museum.

SYSTEMATIC DESCRIPTIONS

Goniatites warslowensis sp. nov.

Plate 3, figs. 1–3, 5–7; Plate 4, figs. 1–8

Holotype. Zl 5230, Pl. 4, fig. 7, text-fig. 1.

Paratypes. Zl 5225, Pl. 4, fig. 6, Zl 5226, Pl. 4, fig. 4, text-fig. 3; Zl 5227, Pl. 3, fig. 7, text-fig. 2; Zl 5248, Pl. 3, fig. 2; Zl 5311, Pl. 3, fig. 5.

Locality. Warslow Brook at Warslow to Clayton footbridge, Manifold valley, North Staffordshire.

Horizon. Upper Viséan, Bollandian, P_{1c} Zone, probably between the horizons of *G. falcatus* and *G. elegans*.

Description. The species varies considerably in the characters of the suture line, and also in shape, and may be divided on these variations into four groups which tend to



TEXT-FIGS. 1-7

Figs. 1-6. *Goniatites warslowensis* sp. nov. 1, ZI 5230, holotype, suture at 15 mm. diam. $\times 4.1$. 2, ZI 5227, paratype, suture at 17 mm. diam. $\times 3.75$. 3, ZI 5226, paratype, suture at 14½ mm. diam. $\times 4.37$. 4, ZI 5224, suture at 18 mm. diam. $\times 3.44$. 5, ZI 5239, suture at 30 mm. diam. $\times 2.08$. 6, ZI 5231, suture at 22 mm. diam. $\times 2.81$.

Fig. 7. *Pronorites ludfordi* sp. nov. ZI 5234, paratype, suture at 25 mm. diam. $\times 6.25$, 6th lateral lobe drawn from holotype, ZI 5233.

grade one into the other:

(a) A globose form with wide depressed venter having a thickness equal to the diameter at 15 mm., and with open umbilicus with rounded margin. The sutures, which are rather crowded (about 18-20 to the whorl), have ventral lobes with cheeks markedly

inturned towards the base. This ventral lobe varies considerably in width in different specimens, but there is a tendency for the cheeks to be upright in the young and to diverge more noticeably in later life (see ZI 5230). To this form, which is the most distinctive of the four groups, belong the holotype and above-cited paratypes.

(b) A subglobose form in which the inturned portion at the base of the cheeks of the ventral lobe is shorter and the ventral lobe has a more upright appearance. To this group belong ZI 5224, Pl. 3, fig. 1, text-fig. 4; ZI 5229, Pl. 4, fig. 2; ZI 5241, Pl. 4, fig. 3; ZI 5650, Pl. 4, fig. 1; and ZI 5651.

(c) A compressed form with comparatively narrow base to the ventral lobe, which has cheeks which are nearly straight or slightly sinuous or slightly convex on the inner surface, such as ZI 5228, Pl. 4, fig. 5, ZI 5239, Pl. 4, fig. 8, text-fig. 5, ZI 5240, Pl. 3, fig. 6.

(d) A compressed form in which the cheeks of the ventral lobe become widely divergent with straight-sided cheeks in the adult, and the ventral lobe has a wide base, such as ZI 5231, Pl. 3, fig. 3, and ZI 5652-3.

The lateral lobe of the suture line is of medium width, with sinuous cheeks (except in ZI 5240) and with a very narrow basal spike, which increases in prominence during ontogeny, becoming a marked channel-like feature in later life. (See ZI 5231, Pl. 3, fig. 3; ZI 5650, Pl. 4, fig. 1.)

The ornament consists of both transverse and spiral striae. The transverse striae are crenulate in the young, but the crenulations become feebler with age. The transverse and spiral striae are of approximately equal strength. In the young at about 9 mm. diameter (ZI 5248, Pl. 3, fig. 2) the transverse striae emerge from the umbilicus approximately radially, bend somewhat backward on the lower half of the flank, and then sweep boldly and broadly forward over the latero-ventral shoulder, flattening to normal over the venter. This direction of the striae is reminiscent of that of *G. waddingtoni* Bisat (86971), and of other variants of the *G. sphaericostratus* stock collected by Mr. E. W. J. Moore in Co. Leitrim, Eire. With increasing age the above bold forward sweep rapidly diminishes, and the transverse striae emerge radially from the umbilicus, bend somewhat backward on the upper half of the flank (ZI 5311, Pl. 3, fig. 5) and flatten to normal over the venter (ZI 5227, Pl. 3, fig. 7).

Most of the specimens on which the above description is based are rather small, being of the order of 15-25 mm. diameter, but fragmentary specimens of larger diameter occur, one of which (ZI 5649) with a diameter of about 42 mm., although badly preserved, shows a broad lingua and hyponomic sinus, and somewhat undulating transverse ornament on the flank, which develops wrinkles on the lingua. The hyponomic sinus evidently develops late in life as there is no sign of it up to 25 mm. diameter.

Constrictions on the internal cast are very rare. The umbilicus is always open. It has a rounded or sub-acute border, and is generally about 25 per cent. of the diameter,

EXPLANATION OF PLATE 3

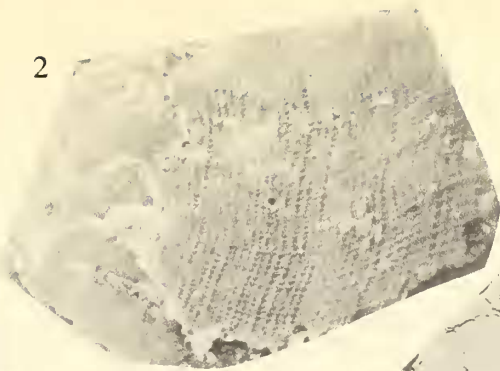
All the specimens are from the Upper Viséan, P_{1c} Zone, Warslow Brook, North Staffordshire.

Figs. 1-3, 5-7. *Goniatites warslowensis* sp. nov. 1, ZI 5224, × 3·7. 2, ZI 5248, × 5·7, paratype showing flank ornament in the young. 3, ZI 5321, × 3·7. 5, ZI 5311, × 5·7. 6, ZI 5240, × 3·7. 7, ZI 5227, × 5·7, paratype showing ventral ornament at 25 mm. diameter.

Fig. 4. *Pronorites ludfordi* sp. nov., holotype, ZI 5233, × 3·7.



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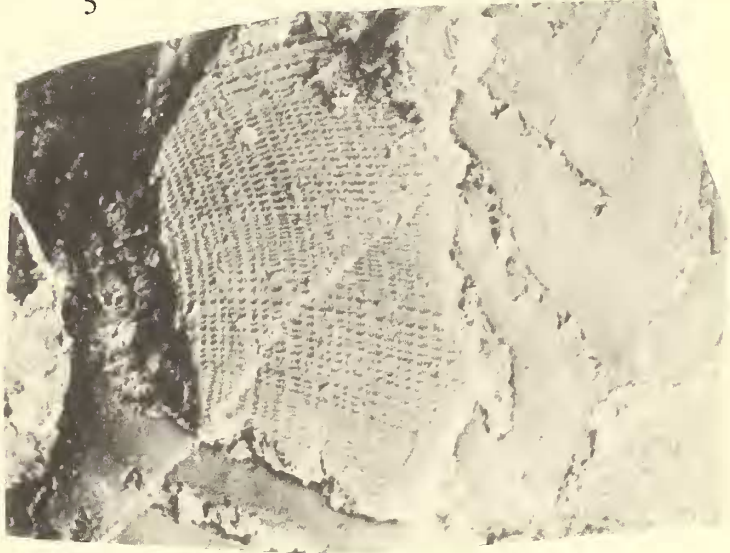


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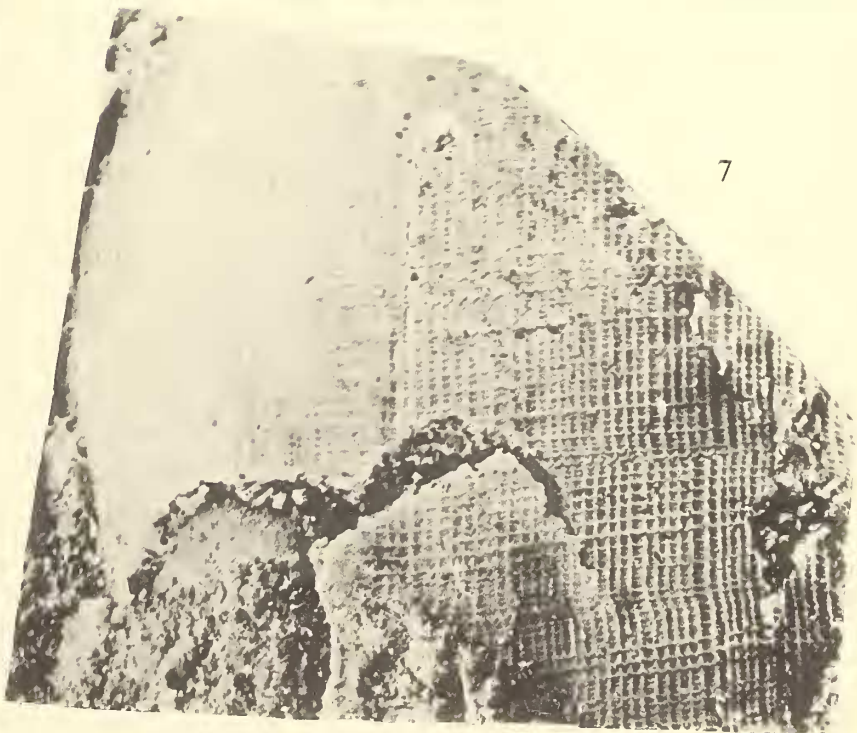
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6



7



BISAT, Viséan Goniatites

though it is somewhat greater in young specimens, and tends to be rather smaller in the more compressed forms.

Remarks. It would appear from the character of the suture lines, and from the stratigraphy so far as that can be deduced, that the horizon of this species lies in the Bollandian above that of *G. falcatus* and below that of *G. elegans*. The Warslow Brook specimen ZI 5230 compares well in shape and suture line with ZI 4073 collected by Mr. E. W. J. Moore from near Loughaphonta, Co. Leitrim, Eire, at a horizon above *G. falcatus* and below a series of beds containing *G. sphaericostratus* and allied forms. The Warslow Brook specimen also comes close to G.S. 86397 collected by Mr. Moore at Dinckley, R. Ribble, Lancashire, from an horizon between *G. falcatus* and *G. elegans*.

Apart from the above specimens the nearest species to *G. warslowensis* so far as similarity of suture lines is a guide appears to be the form of *G. falcatus* which occurs at horizon Co 6 (of Bisat 1952) Cowdale Clough (59612) and the similarly sutured specimen from M3 Little Mearley Clough, Pendle Hill (85656) figured by the writer (1952, p. 172, fig. 3e). There is also close similarity between the form of *G. warslowensis* with divergent cheeks to the ventral lobe (ZI 5231, Pl. 3, fig. 3) and the suture line of a specimen of *G. falcatus* from Dinckley (85657) figured op. cit., fig. 3a. Similarities also exist between the suture lines of *G. warslowensis* and those of *G. sphaericostratus* from Co. Leitrim. Compare, for instance, that of ZI 5230 with ZI 5646 and 5648 from Co. Leitrim, the basal spike to the lateral lobe in the Irish specimens being less of a noticeable feature than in *G. warslowensis*, but otherwise there is the same general type of suture line, and similar variations in the character of the ventral lobe in different specimens. In *G. sphaericostratus*, however, the spiral striae become dominant, unlike *G. warslowensis*.

G. intermedius Kobold 1933 *non* Brown 1841 which apparently comes from a lower horizon than *G. warslowensis*, has a very similar type of ornament (Kobold 1933, pl. 22, fig. 3), and the lateral lobes of the suture lines of the two species are not dissimilar (Kobold 1933, pl. 22, fig. 2) but the two species differ in the size of the umbilicus, which in *intermedius* is only $\frac{1}{5}$ th of the diameter (Kobold 1933, p. 487), and the ventral lobe of *intermedius* does not seem to have been clearly seen.

Pronorites ludfordi sp. nov.

Plate 3, fig. 4

Holotype. ZI 5233, Pl. 3, fig. 4. *Paratypes.* ZI 5232; ZI 5234, text-fig. 7.

Locality and horizon. As for *G. warslowensis*.

Description. This species differs from *P. cyclolobus* (Phillips) as figured by Foord and Crick (1897, p. 261, fig. 125) in that the 4th lateral lobe at a whorl height of 9 mm. (diameter *c.* 25 mm.) is deeper and narrower and lies wholly on the flank, the 5th lateral lobe is on the umbilical crest, whilst there is a 6th lateral lobe on the umbilical wall seen in ZI 5233 at a whorl height of 12 mm. The suture line shows an approach to that of *Pronorites* (*Stenopronorites*) *uralensis* (Karpinsky), but this latter form has the 5th lateral lobe on the edge of the flank at $9\frac{1}{2}$ mm. whorl height, and also the ventral lobe lacks the constriction or neck near its mouth which is characteristic of both *cyclolobus* and *ludfordi*. *P. uralensis* is stated to be of Namurian age.